Water Solutions of Amphiphilic Polymers : Nanostructure Formation and Possibilities for Catalysis(Soft Matter as Structured Materials)

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The chemical structure of the majority of monomer units of water-soluble polymers involves both polar and non-polar atomic groups, i.e. these monomer units are amphiphilic. This fully applies also to monomer units of biopolymers (DNA, RNA, proteins, polysaccharides).

Such amphiphilic nature means surface activity with respect to the oil-water boundaries, as well as to the boundaries of polymer globules with hydrophobic core. This fact leads to significant changes in the properties of polymeric globules containing amphiphilic monomer units. In particular, non-spherical globular shapes are favored, and globular solution becomes highly stable with respect to the aggregation.

Other aspect of this problem is connected with relatively small fraction of volume occupied in the system by surface layers of nanometer width (in oil/water emulsions or in globular solution). In this case, when the surface activity of components (monomer units or low-molecular ligands) is high, the surface layers can play the role of surface catalytic nanoreactors, where reaction-active groups are concentrated and specifically oriented with respect to each other.

This gives the possibility to use the solution of polymeric globules, as well as other polymer systems with developed sharp interphase boundaries, as catalysts for the reactions involving surface active substrates. The experimental realization of such possibility will be presented.

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